



**US Army Corps  
of Engineers®**

Engineer Research and  
Development Center

**Ongoing Research**

## **Battlespace Terrain Reasoning and Awareness (BTRA)**

### **Problem**

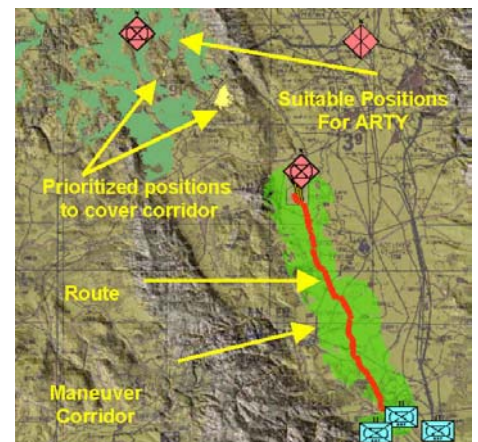
Terrain and weather effects represent fundamental, enabling pieces of battlefield information supporting situation awareness and the decisionmaking processes within Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance (C4ISR). These effects can both enhance or constrain force tactics and behaviors, platform performance (ground and air), system performance (e.g., sensors) and the soldier. BTRA focuses on the development of software analytics designed to create information and knowledge products that capture integrated terrain and weather effects and develop predictive decision tools to exploit those products. The ultimate objective is to empower commanders, soldiers, and systems with information that allows them to understand and incorporate the impacts of terrain and weather on their functional responsibilities and processes.

### **Description of Research**

BTRA developments stress computational efficiency; they seek to maximize the ratio between a product's actionable information content and its size to ensure its ability to facilitate a Network Centric Battle Command. BTRA decision tools are designed and engineered to be embeddable in other host C4ISR systems and applications, or as services within the concept of a "system of systems."

### **Expected Products**

BTRA research has focused on the development of six information generation components and five decision tools addressing terrain and weather effects. Each of these components utilizes terrain feature data, digital elevation models, current and forecasted weather and information regarding tactics, techniques, and system performance. BTRA generates information addressing: (1) Observation, Cover and Concealment, Obstacles and Mobility, Key terrain and Avenues of approach (OCOKA), (2) integrated products defining operational Positions of Advantage, (3) high fidelity weather/terrain effects of mobility and signature physics, (4) advanced mobility analysis, (5) digital ground and air maneuver potential and (6) tactical structures relating information produced by the other Battlefield components.



Decision tools operate on BTRA information products, not on the original data. These tools support: (1) predictive multi-criteria, multi-objective maneuver, and logistical route analysis for ground and air platforms and forces, (2) predictive sensor performance (e.g., infrared [IR], millimeter-wave [MMW], seismic, and acoustic), (3) situation assessment and (4) predictive threat assessment.

BTRA will continue R&D through 2006. Mature BTRA components (Version 2.0) have been fielded in the Army's Digital Topographic Support System (DTSS, ver. 8.0). Similar capability has also been fielded in the Air Force's Time Critical Targeting Facility, part of Theater Battle Management Core Systems (Baseline 10). Under funding from the Office of the Secretary of Defense, BTRA will continue the transition of current and maturing capabilities to the National Geospatial Intelligence Agency's (NGA's) Commercial Joint Mapping Toolkit (CJMTK). Under a memoran-

dum of agreement (MOA), the ERDC will embark on joint technology development with NGA.

**Potential Users**

BTRA products will empower a spectrum of users (commanders, soldiers, and systems) with information that allows them to understand and incorporate the impacts of terrain and weather on their functional responsibilities and processes.

**Projected Benefits**

BTRA research, development, products and architectural approach are designed to empower the Joint and Future Force's Battle Command, and Intelligence, Surveillance, and Reconnaissance (ISR) processes and systems in a networked force structure through the incorporation of actionable terrain and weather information and tools. The BTRA approach is wholly consistent with the Army's Future Combat System's (FCS) System of Systems and the Defense Information Systems Agency's (DISA) Network Centric Enterprise Services concepts. If successful, BTRA will be capable of benefiting the FCS C4ISR appliqué and the Joint Distributed Common Ground Station family of ISR systems.

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**Participating ERDC  
Laboratories**

Topographic Engineering Center (TEC), Cold Regions Research and Engineering Laboratory (CRREL), and the Geotechnical and Structures Laboratory (GSL)